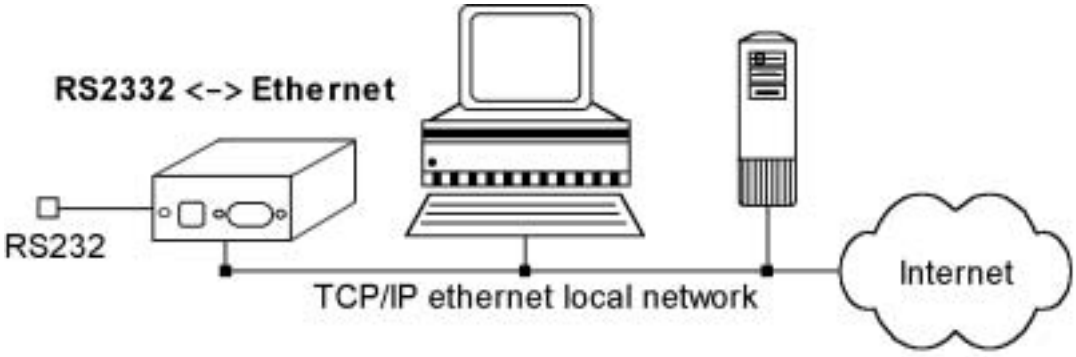
RS-232/485 Ethernet converter

&

Ethernet I/O Controller



The complete shipment contains

- Closed converter box with a unique preset MAC address.
- RS232 interconnection cable (serial port extension cord, Cannon 9 - 1:1)
- Datasheet.

We can supply upon request:

- Brackets for wall mounting.
- RS232/RS485 conversion module (no galvanic insulation)

Basic communication types

TCP server (Passive mode)

After powering up, the converter listens on the given port and awaits client connection. When the client connects, data from the Ethernet are sent to the serial line and vice versa. If the client is not connected and data are coming from the serial line, they are stored in a buffer (size is configurable) and transmitted immediately after establishing a connection, unless clearing of the buffer upon establishing a connection has been requested in the SETUP.

TCP client (Active mode)

The converter behaves similarly to the previous case. However, when data arrive from the serial line, it tries to actively establish the connection to the specified remote IP address as a client and transmit the data. If it does not succeed, data are kept in the buffer and transferred as soon as a connection is established, regardless of the converter connection mode (client or server). In this mode, two converters communicating with each other can "tunnel" the serial line through the Ethernet. And, when using the Charon modules or the I/O Controller, the Ethernet can be used to extend the parallel inputs and outputs as well.

UDP

Data from the Ethernet are expected on a given port. Data coming from the serial line form a packet according to the specified triggers and are sent to a specified IP address. During UDP transfer, acknowledgements from the remote side are not verified; the application itself should support recovery from a data loss. An advantage is a shorter response time, useful especially for RS485 lines.

NVT (Network Virtual Terminal)

When using TCP/IP communication, the converter function can be enhanced via NVT according to RFC2217 using a control data stream that can, for example, change the baud rate of the remote serial port, control inputs and outputs, or clear the buffer. These control commands are mixed into the data stream and prefixed with "FF" ("FF"s in the regular data stream are doubled). Detailed description of NVT is available in the **"Programming Ethernet Applications"** guide at our website that also describes the supplied communication subroutines.

RS232/485 - ETHERNET Converter

The asynchronous serial line conversion to the ethernet include support of RS485 protocols. Features : TCP/IP , UDP/IP., NVT, TEA and many more..

*The **I/O Controller** contains all functions of the converter and adds support of 8 + 8 binary inputs + outputs with using the NVT– see the last chapter…*

Converter features

- Serial RS232 port accessible over an Ethernet network.
- Configurable communication speed 300..115200 Bd, handshake (CTS/RTS, Xon/Xoff, none)
- RJ 45 interface - 10BASE-T and RS-232.
- Parameters configured locally over RS232 or over the Ethernet using a Windows application.
- Support for TCP/IP data transfer - TELNET-like client + optional NVT support (Network Virtual Terminal)
- Option to activate UDP transfer with RS485 support.
- Triggers for packet start and packet end.
- Support for passive or active mode (the converter can establish a connection with the remote side upon serial line activity)
- Two devices can extend a serial port over the Ethernet.
- Security measures consist of a fixed specification of the remote IP address range and optional connection authorization using the 128-bit TEA encryption algorithm.
- Support for interfacing with special software, or a Windows configuration application.
- It is possible to add x51 assembly code for protocol conversion between the Ethernet and the serial line. This way the converter can for example recognize your proprietary protocols and so on.

Converter Applications

- Instrumentation control and monitoring over the Ethernet.
- Connection of any device controlled over RS232 to the Internet through Ethernet.
- Securely authorized access to a device over the Internet from anywhere.
- Support for UDP communication - fast and advantageous for Ethernet LANs.

Basic HW parameters

Electrical parameters	
Power supply	DC 8-20V / 0.2A - Polarity: 
Dimensions	38 x 105 x 135 (H x W x D)
Temp. ranges	Temperature : 5 – 50 °C
Ethernet	RJ45 – 10BaseT – IEEE 802.3
Serial port	1x DB9F (RxD,TxD,RTS,CTS,GND)
RS485	With internal RS485 module only

Network parameters	
Supported protocols	TCP/IP + NVT, UDP/IP
RS232 - transfer rate	300 – 115.200 Bd
RS232 – data stream	RTS/CTS, Xon/Xoff, none
RS232 - data	8 or 7 data bits
RS232 – parity	None/Odd/Even/Mark/Space
TCP connection close	Data/ACK/NOP timeout 50s

Connector description

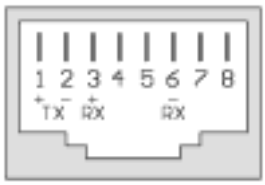
PC RS232 Port Cannon 9 - Male	
Pin	**Signal**
1 <-	CD
2 <-	RxD
3 ->	TxD
4 ->	DTR
5 --	GND
6 <-	DSR
7 ->	RTS
8 <-	CTS
9 <-	RI

RS232 Converter Port Cannon 9 - Female	
Pin	**Signal**
1 <->	
2 ->	TxD
3 <-	RxD
4	Setup ON
5 --	GND
6	„B" *RS485*
7 <-	CTS
8 ->	RTS
9 <->	„A" *RS485*

Power supply:

DC 8..20V / max. 0.3 A

Ethernet :



RS485 converter module

The module for physical RS485 conversion is not supplied. However, it can be ordered as a separate accessory for no additional charge. The RS485 line is wired according to the description of the Cannon 9 connector. When installing the module, please remove the top two jumpers and insert the module.

For configuration, you will probably need to use the original RS232. Do not forget to insert the two jumpers after removing the module. Looking at the converter with the Cannon 9 and RJ45 connectors on the right side, the top two jumpers next to the Cannon 9 connector need to be in place. Two empty jumper positions should remain below them. Here is a detailed diagram of the connector wiring.

Converter connection configurations

Converter <-TCP/IP-> PC

The PC can open a network connection, e.g. with the TeraTerm program, to the converter IP address and port 23. For the opposite direction, a server program needs to be installed on the PC. This mode is the most common one for monitoring and remote control of any device over the serial port.

Converter <-UDP/IP-> PC

Special software is needed for connecting to the converter. UDP is intended for transferring data on a local segment of an internal network only. We do not recommend UDP for communication over longer distances.

Converter <-TCP/IP-> Konvertor

Two devices bridge the serial ports over the Ethernet network - creating a "virtual wire". Converters can authorize themselves upon establishing the connection, remote IP addresses can be restricted. As a result, serial ports of two devices can be connected together via the world-wide network. The serial ports can communicate with different speeds; this can sometimes decrease latency.

Converter <-UDP/IP-> Konvertor

Special software is needed for connecting to the converter. UDP is intended for transferring data on a local segment of an internal network only. We do not recommend UDP for communication over longer distances.

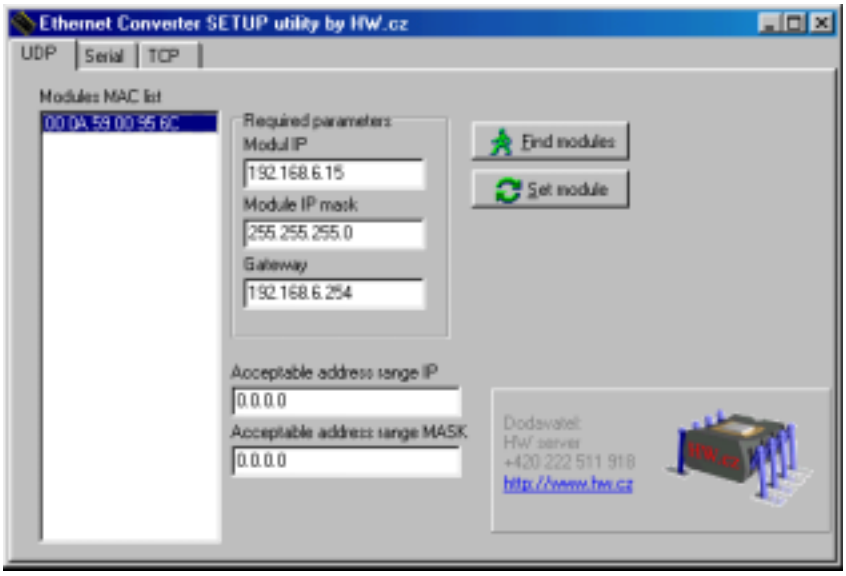
Installation

Mechanical installation

Converter is supplied in a metal box with four self-tapping screws in the sides. The screws are 80 mm apart, their diameter is 3 mm. The box can be attached with these screws into a custom "L" profile 1.2 mm thick. We supply the sidewise "L" profiles as optional accessories. Drawings of the box and the profiles are available upon request.

Configuring the converter parameters

The converter needs to be configured before it can be used in routine operation. Converter parameters (IP address, mask, gateway, serial port speed, etc.) can be configured by the software shown in the figure. It is available for download at our website.



Three configuration methods are available:

- **Locally over a RS232 serial line.** All parameters can be configured using a textual setup menu.
- **Over the network, using an UDP application for Windows.** Basic network parameters are configurable.**Limited to a local Ethernet segment only.**
- **Over the network using TCP** (everything can be configured and the device can be anywhere; however, the netmask, GW and IP address must be pre-configured and cannot be changed in this mode). Remote configuration over TCP/IP has to be enabled through a special option accessible in the RS232 SETUP.

SETUP over the serial RS232 line

For converter configuration, set the RS232 line parameters to 9600Bd, 8N1. The PC can be connected using the supplied cable with Canon 9 connectors.

Activation of the setup mode:

- Drive pin 4 (DTR) low when the converter powers up. Jumper JP3 needs to be in the 1-2 **("PC")** position - factory default. This method is used by the configuration SW.
- Automatically at power up, if the jumper JP3 is in the 2-3 position ("**SETUP**"). (*to the left from the connectors*).
- The setup menu cannot be activated if the jumper JP3 is removed entirely.

The converter can be configured using any terminal in line mode, you don't need our software. However, in that case, you need to manipulate with the JP3 jumper, or need a terminal that can define the value of DTR - for example, TeraTerm can't do it.
The configuration itself is performed by communicating with the converter over the serial line. After powering up, the converter tests the JP3 jumper. If present, it sends the following screen over the serial port. (**Port settings: 9600 Bd 8N1**)

If the converter does not respond, verify the serial port settings. If no success, verify the serial cable wiring. Then, verify the JP3 setting on the converter board. Network activity (receiving and transmitting) is indicated by the LEDs ETx and ERx on the PCB turning off. The converter reacts to ICMP Echo requests ("ping") for the given IP address. Response time is 4 ms. To set the IP address for testing "PING" replies, our program in UDP mode can be used.

The configuration itself is performed by typing the letter(s) identifying the option and its value. (for examle „**I192.168.6.8**“ to set the device IP address).
Help for an option is printed by sending its letter, question mark and <Enter> – „**I? <Enter>**“.

A figure detailing this configuration process is shown on the page with the list of configuration options.

Over the network using UDP

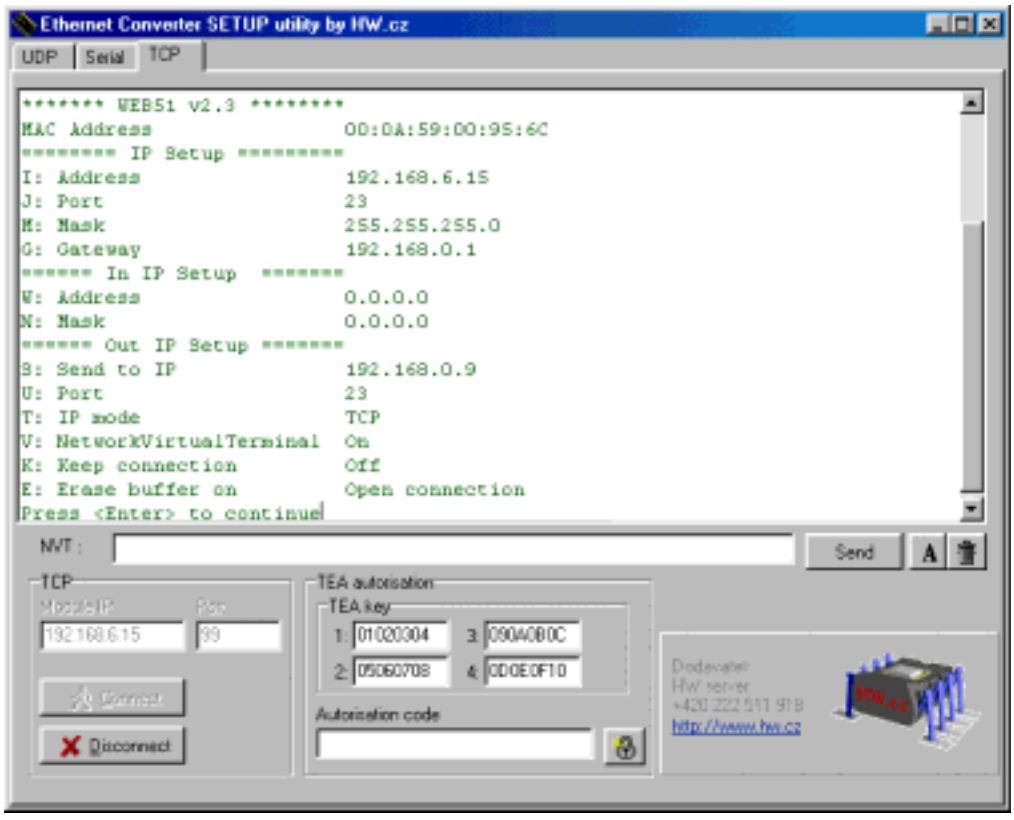
The configuration is performed using our program; see the figure on the previous page. In this mode, the converter can be detected and configured on a local network segment only. No routers, firewalls, or other devices filtering UDP broadcasts can stand in the way.

Over the network using TCP

Using our program or any telnet that supports TEA. See the figure on this page for an example. This setup can be disabled by the **"%S: TCP/IP setup"** option in the RS232 setup.

This configuration mode is protected with the chosen TEA key that is required for access to the device (unless the password requirement is disabled in the setup). Thus, the configuration process is secure enough even for remote configuring from anywhere in the world.

Note: *Configuration over TCP is not possible for HW version 4.5 and* ***the "I/O Controller"*** *version.*



Application tips and recommendations

Security

To increase security in TCP mode, both sides can authorize themselves via the symmetric TEA 128 cipher whenever a connection is established. The password set on both sides will not travel over the network. This option is available only for TCP/IP connections. UDP mode is intended for local networks only. Detailed TEA description is available in the **"Programming Ethernet Applications"** guide at our website.

Increasing connection timeout

Since the converter supports only one concurrent connection, a timeout needs to be set. By default, a connection is terminated 50 seconds after the last data transfer. However, it is possible to enable **"K: Keep connection"** to send a NOP into the open NVT connection once about every 10s. Starting with version 2.4, a new function will allow a connection to remain open after timing out until someone else wants to establish another connection. In that case, if no data are transmitted for about 50s and someone else tries to access the converter, the converter closes the inactive connection and attends to the new connection.

Access to the NVT port

Starting with version 2.4, a separate port with enabled processing of NVT commands is implemented on the same IP address. The original port can have the NVT commands turned off. This can be used for example to create a transparent "raw" conversion from the IP address to RS232 and at the same time control inputs and outputs via NVT on another port, or use 9-bit RS232 communication.

Packet triggers in the UDP mode

The converter in UDP mode supports RS485 protocols. By configuring the protocol parameters, response time over the Ethernet can be reduced from about 20-100 ms in TCP/IP mode to 10-20 ms.

The converter can recognize the end of a RS485 packet and send the data to the other side without waiting for a timeout to expire. The following conditions trigger the end of collecting data from RS485 and transmission over the Ethernet in one packet. When the triggers overlap, the packet is sent if any one of them is activated. Start and end of a packet is triggered by a sequence of 1 to 4 bytes with a configurable mask.

Converter SETUP mode

MAC Address 00:0A:59:00:95:6C

MAC address is a unique network device address in the Ethernet and is always factory-preset. You can find it on the label inside the device. Using this address, the devices can be distinguished for example in the UDP mode of the configuration program.
The address respects restoring of the default configuration with the "**D0**" command.

I: Address 192.168.6.15

Configuration of the converter's IP address.

J: Port 23

Configuration of the converter's communication port – range: 1 .. 19.999.

Port 99 is used for TCP configuration, if supported by the version and enabled in the setup.

M: Mask 255.255.255.0

Configuration of the IP mask for the local network. All IP addresses outside of the area delimited by the converter's own IP address and this mask will be accessed via the Gateway.

G: Gateway 192.168.6.254

Address of the gateway that provides access to outside networks, as defined by the IP address and the mask.

Consequence of the MASK, IP and GW

Ethernet device communicates :

- You don't even need Gateway in **local ethernet** but IP adrresses of both sides must be chosen from allowed mask.

  Therefore there might be difference on the last byte only from IP address when configuraton of mask is 255.255.255.0

- **Out of local net - use Gateway**, that is located in MASK allowed range of IP addresses.

Besides basic configuration it is possible to restrict the range of IP addresses that the conveter will not communicate with in „**In IP Setup**". We recommend to keep this paramether on the value 0.0.0.0.

====== In IP Setup ======

W: Address 0.0.0.0

IP address of a network or computer that is allowed to communicate with the converter. This value must result from multiplying the remote IP address and the restriction mask (option N), otherwise the converter does not react.

N: Mask 0.0.0.0

This mask restricts addresses that may communicate with the converter. Security can be greatly enhanced by setting a fixed address or a suitable restrictive mask that disallow communication with unauthorized parties.

====== Out IP Setup ======

S: Send to IP 192.168.0.252

U: Port 23

Remote IP address and port for establishing a connection upon reception of data from the serial port. Value 0.0.0.0 switches the converter into **passive mode**.

Note: If UDP communication is used, a remote address must be specified here. *The converter* does not establish connections, responses are sent to this address only!

T: IP mode TCP

Switches between the TCP and UDP protocols. UDP is faster but packets can be lost or delivered out of order. Hence it is suitable for communication only on a local network segment in request-reply mode, usually for converting a RS485 communication. UDP communication is hard to debug since there is no simple PC terminal (like TELNET for TCP/IP).

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IP mode: 0: TCP / 1: UDP

V: NetworkVirtualTerminal Off

Network Virtual Terminal allows the interpreting of Telnet protocol sequences including certain RFC2217 extensions, enabling on-the-fly changes of serial port parameters (speed, parity, ...). NVT description is available in the "**Programming Ethernet Applications**" guide at our website.

When communicating with the serial port using telnet, e.g. with the TeraTerm program, this option should be turned on. Otherwise, telnet control commands (seen as "junk") intended for configuration negotiation at the beginning of the communication are forwarded to the serial port. If you don't want to use this option, set your client to RAW communication mode.

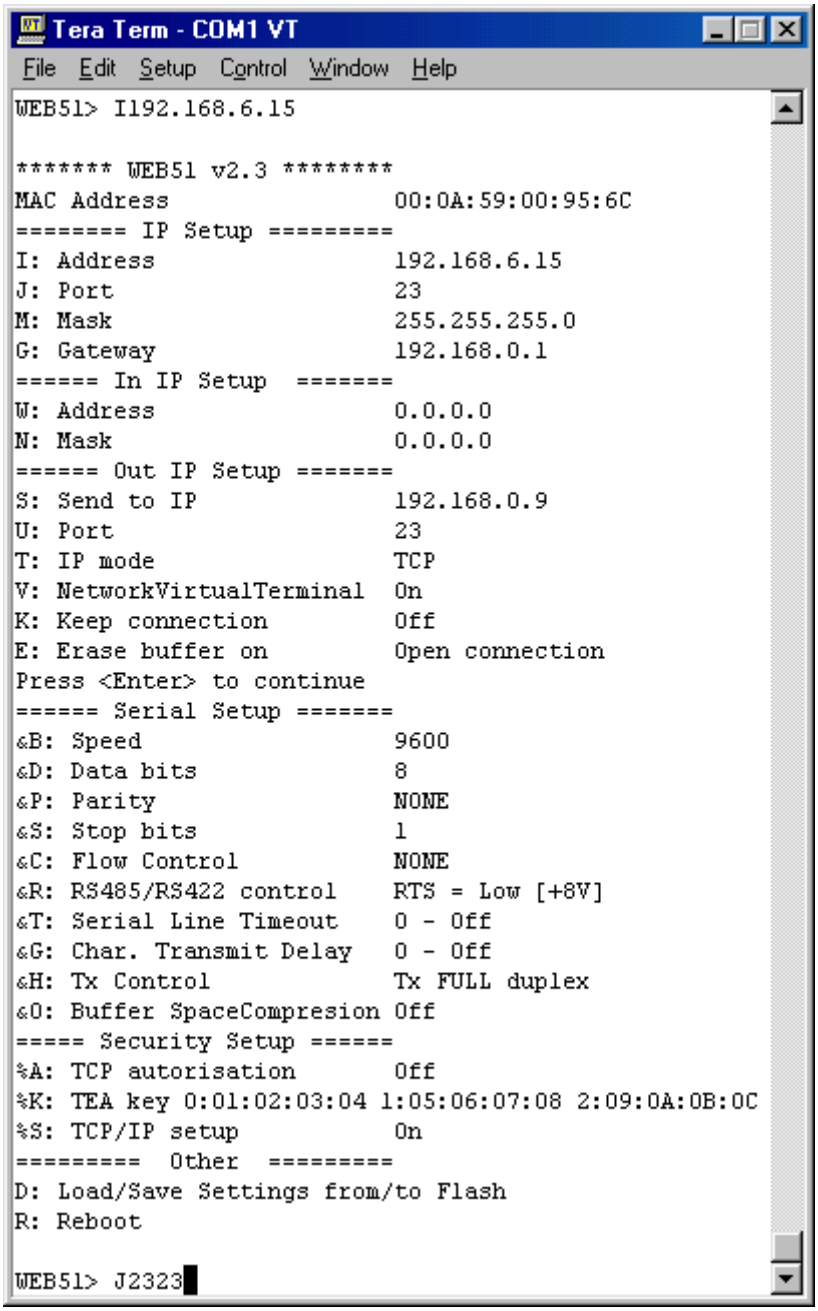
0: Off (don't use telnet control code, pass through to serial port)
1: On (accept telnet control code)

K: Keep connection Off

This option allows keeping the connection alive with NOP commands, as long as NVT is on. (see "**Increasing connection timeout**" in the **Application Tips** section).
0: no keep connection (prefered)
1: keep connection

E: Erase buffer on Open connection

Option to clear the internal converter buffer whenever a connection is established or closed. This option is useful e.g. if your device periodically says "I'm alive" and you don't want to waste time retrieving these notifications from the buffer.
0: none
1: close TCP/IP connection
2: open TCP/IP connection
3: open & Close TCP/IP connection



====== Serial Setup ======

&B: Speed 9600

Configuration of the communication speed for the serial line, range 50..115.200 Bd. To set 9600 Bd, enter : „**&B9600**“.

&D: Data bits 8

Number of data bits for the serial transfer. Options are :
7: 7 bits / 8: 8 bits – issue „&D8“

&P: Parity NONE

Parity of the serial asynchronous communication:
N: none / O: odd / E: even / M: mark / S: space

&S: Stop bits 2

Number of stop bits for the RS232 serial line. It is possible to set 1 or 2 bits.

&C: Flow Control NONE

Flow control configuration for the serial ports. For details, see the box on the previous page.

- **1: none** - No flow control, see &R for the RTS level.
- **2: RTS/CTS** – Control pins RTS/CTS
- **3: Xon/Xoff** - SW flow control.

&R: RS485/RS422 control

Defines idle level of the output RTS pin. Important for devices powered from RTS or for add-on RS485 converters that use RTS to switch direction. Especially for the internal RS485 module, the "**HW echo**" option should be on. This means that the receiver reads the data back from RS485 and generates hardware echo from the actual RS485 bus.

Note: *For the internal RS485 module, use &R3 and &R4 options.*

- **0: RTS = Low [+8V] (recomended for non RS485/422 mode)**
- **1: RTS = High [-8V]**
- **2: TxRTS HW echo ON**
- **3: TxRTS HW echo OFF**

&T: Serial Line Timeout 0 – Off

Specifies how long the converter waits after receiving a character before wrapping up the data in a packet and transmitting them. The timeout is specified as the number of characters and displayed as the number of chars as well as time according to the given serial communication speed. If the speed changes, the time is changed also but the number of characters defining the timeout is not (10 characters at 9600 Bd = about 11 ms, or 5.7ms at 19,200 Bd).

&G: Char. Transmit Delay 0 – Off

For controlling units with small RS232 buffer, it is sometimes advantageous to keep relatively high baudrate but insert delays between individual characters. The delay is in **milliseconds** and is defined as the time between the starts of individual characters; so, for 2400 Bd a 2ms delay has no effect since the character starts are 2.4 ms apart.

&H: Tx Control Tx FULL duplex

When HALF duplex is activated, the converter assumes unidirectional medium connected to the serial line (e.g. RS485) and won't start transmitting data while receiving.

0: FULL duplex
1: HALF duplex (RS485)

&M: Serial buffer size Medium Rx / Medium Tx

Sets the size of the ring buffer in the converter memory for individual directions. For example, to collect data from the serial line, it is advantageous to use option "**2: High Rx / Low Tx**".

0: Medium Rx / Medium Tx (approx. 50% / 50% of memory)
1: Low Rx / High Tx (approx. 30% / 70% of memory)
2: High Rx / Low Tx (approx. 70% / 30% of memory)

&O: Buffer SpaceCompresion Off

Memory can be sometimes saved using space compression - especially when storing unified lines of text. In such a case, one of the compression options can be useful:

0: Off
1: On (compress on serial buffer, send unexpanded on I/O)
2: Transparent (compress on serial buffer, expand on I/O)

===== Security Setup ======

%A: TCP autorisation Off

Activates TEA authorization - requested from the remote side after the connection is established.

0: TEA authorisation Off
1: TEA authorisation On

%K: TEA key 0:01:02:03:04 1:05:06:07:08 2:09:0A:0B:0C 3:0D:0E:0F:10

To set the TEA key, use the "%K" option. Set 16 bytes in quadruples using four hexadecimal values separated with colons. The first string defines 0-3rd quadruple of bytes. So, to set the last 4 bytes to the displayed value, use **"%K 3:0D:0E:0F:10".**

%S: TCP/IP setup On

Enables remote configuration via the TCP setup.

========= Other =========

D: Load/Save Settings from/to Flash

Options **"D0"** and **"D1"** reload default factory settings.

R: Reboot

Soft restart of the converter. Necessary after changing the IP address, etc.

UDP mode settings

If you select **"T: IP mode UDP"**, the converter will communicate with the remote side using unacknowledged UDP packets. Also, the following menu appears in the setup.

==== Trigerring Setup =====

***L: Trigger Length 1**

Number of bytes of the start and end packet trigger condition. Allowed values are 0 to 4. If the lengths of your start and stop triggers differ, use the trigger mask and don't forget to include the masked characters in the lengths - even though they contain actual frame data.

***P: Post Trigger Length 0**

In some protocols, checksum or other info follows the stop trigger. This value defines the number of characters after the stop trigger that should be included in the packet. If the start and stop triggers are equal, this value specifies packet length less the 0 to 4 bytes of start trigger.

***S: Start Trigger Pattern 58.0.0.0**

Start trigger for packet transmission. Four bytes are set, but only the number of bytes specified in "L: Trigger Length" is considered.

***M: Start Trigger Mask 255.0.0.0**

Mask of the start trigger. Masking works similarly to the ethernet netmasks, using a bitwise AND. Value of 255 means that the tested character must be equal to the character specified in "*S: Start Trigger Pattern". For example, to start the transfer with any control ASCII character (0..31d), use 0.0.0.0 for the trigger pattern, 224.0.0.0 for the mask, and 1 for the length. If you set both the character and the mask to 0, the trigger activates for any character.

***X: Stop Trigger Pattern 10.0.0.0**

Sets the stop trigger for sending data to the Ethernet.

***Y: Stop Trigger Mask 255.0.0.0**

Mask of the stop packet trigger for serial line data. For example, the settings displayed here are intended for transferring data in the IntelHEX format over RS485. The start trigger is a colon and the transfer is terminated after receiving the control character <LF> (0Ah = 10d).

***E: Max. Start-Stop Length 999**

Maximum number of characters sent after the start trigger, if the stop trigger is not found sooner. After transmission, another START trigger is expected. Essentially, this is a "timeout" specified as the number of characters.

I/O Controller parameters

The Charon I module or the whole I/O Controller box has the entire standard serial link-TCP/IP converter implemented. As an Add-on function, there is a parallel I/O pins control added into the Controller's firmware.

If you would like to use the binary I/O pins control, you have to make the following steps:

- Use the TCP/IP protocol (the I/O controller should not run the UDP packet mode).
- Switch the NVT (Network Virtual Terminal) on.
- Set up the I/O Controller's setup correctly.

The inputs and outputs are controlled only via the Network Virtual Terminal. It means, that all the I/O pin's commands are transferred together with the TCP/IP packets used for the serial link. The NVT commands have predefined syntax described in the user manual called "Programming of Ethernet Applications".

You can use the „**Hercules SETUP** utility" in the „Test mode" for testing the NVT command support. Download our latest version from the web or from the supplied CD.

Note: Do not forget to RESET the module after setting up its parameters!

Setting up the I/O Controller

#A: Power Up INIT 102

Specifies the start up value, which is stored into the I/O pins after each reset. This value is stored before the module tries to connect to the other side.

#T: Trigger AND mask 240

Defines the logical 1 and the input width. This predefined input will be transferred and synchronized with the other side via TCP/IP. If you set the "0x00" value, the I/O controller does nothing on the input change. If you set the "0xF0" = 240 dec value, the I/O Controller responds on the D7,D6,D5,D4 input pins.

In case the Controller is in the "Active mode" (Client/server mode), the reaction on the input pins is preciously the same as in the Serial link data receive case. If the connection is established, the NVT command is sent to the other side to change its I/O pins value.
If the Controller is in the "Passive mode" (Server only) and the connection is closed, there will be no packets and NVT command send. The information about changed inputs is sent only if there was a connection with a Client established.

Note : *Even there is no information about changed input pins transferred, it is possible to read the I/O pins state using a standard NVT commands.*

The data synchronization after the RESET

The communication parts of the program are initialized after the **#A: Power Up INIT** value is stored into the output pins. After that the Controller is trying to establish the TCP/IP connection with the other side and tries to read the input data using the following function:

OUTPUT = (The data read from the other side AND #B) OR #C

The unit tries to connect the other side during the first 50 seconds after power up. If the connection is not established in 50 seconds, the **#A: Power Up INIT** value will remain on the I/O pins.

#B: Power Up AND mask 255

The other side's values width, which should make changes after receiving the NVT command.

#C: Power Up OR mask 0

Specifies the I/O pins, which might be changed after the RESET is preceded. If you are using some pins as input ones, you can specify these input pins in this value so the input pins cannot be used as output pins.

The data synchronization

OUTPUT = (Output's **value before AND #X) OR (Data received** from other side **AND #Y) OR #Z**

#X: KEEP mask 0

This value defines the output pins, which might be changed by the other side and by the standard NVT access as well.

#Y: AND mask 255

Defines the bits, which are transferred from the other side. For instance 0x00 means that the output should not be changed by the other side. On the other way, the #X=0xFF means, that all the pins might be changed using the NVT command.

#Z: OR mask 0

Specifies the I/O pins, which might be changed after the RESET is preceded. If you are using some pins as input ones, you can specify these input pins in this value so the input pins cannot be used as output pins.

You can set each input or output bit itself. See the following examples for better understanding:

0: **OUTPUT = (X.n =0 Y.n =0 Z.n =0)**
1: **OUTPUT = (Z.n =1)**
It makes the tunnel (Copies the other side): **OUTPUT = (X.n=0 Y.n=1 Z.n=0)**
The bit is set by the NVT commands: **OUTPUT = (X.n=1 Y.n=0 Z.n=0)**

Note : *The input pins are scanned each 1ms. The data value is changed, only if this value stays on the input pins at least 2 machine cycles (1,2 – 2,0ms).*

The I/O pins HardWare

- The **Charon I** module – The parallel mode
  The I/O pins are represented by the 8bit I/O port P1. It is a standard I/O port with the open collector and the 50k pull-up resistor. If the pin is set to 1, it should be used as an input pin.
- The **Charon I** module – The Shift registers
  The binary inputs and outputs are separated and realized by two 74595 shift registers connected to the P1 port. The HW connection is the same as in the **Charon I&II Development Board**.
- The final **I/O Controller** product has all the pins galvanically separated. The HW solution is described bellow.

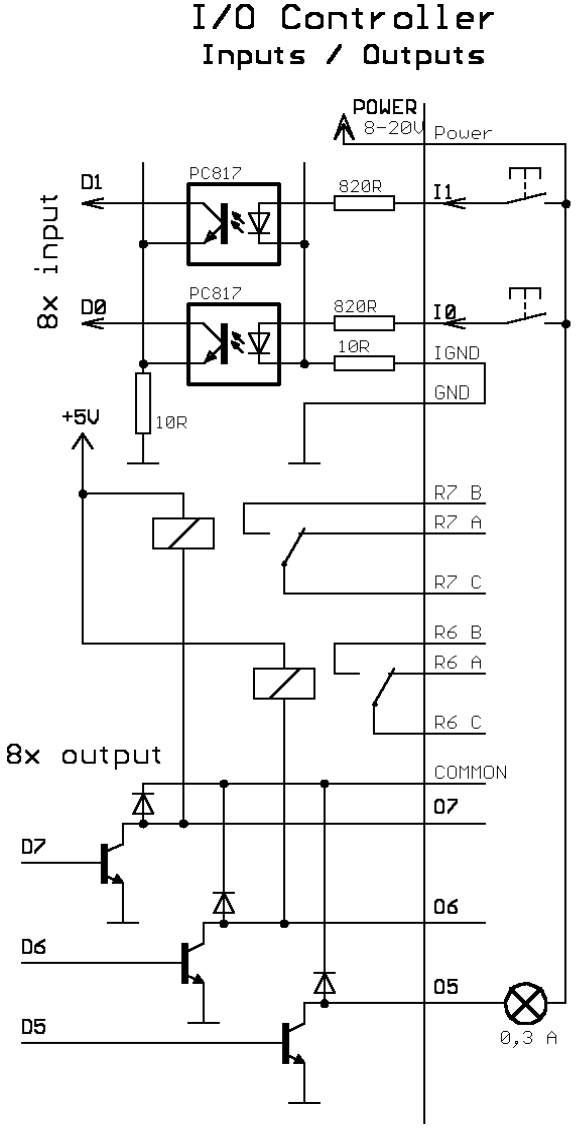
Inputs of the I/O Controller

All 8 inputs are implemented using 8 optocouplers with a common ground on the IGND pin. The **optocouplers input voltage range is 5 .. 15 V**. The IGND pin needs to be connected to GND on the outside connector. Then, the pins can be simply controlled via contacts to the POWER pin that provides supply voltage from the adapter input on the Cannon 37F connector. Maximum current load of the Power pin is 300 mA!

Outputs of the I/O Controller

Outputs are implemented with eight transistors using the "open collector" circuit. Two outputs are internally connected to a relay whose switching contacts are also available. The protective diodes of the transistors are connected to the common pin, which should be connected to the positive supply terminal of e.g. external relays. This way the pins are be protected from voltage spikes.

The diagram next to the Cannon 37F pinout table shows the pin connections.



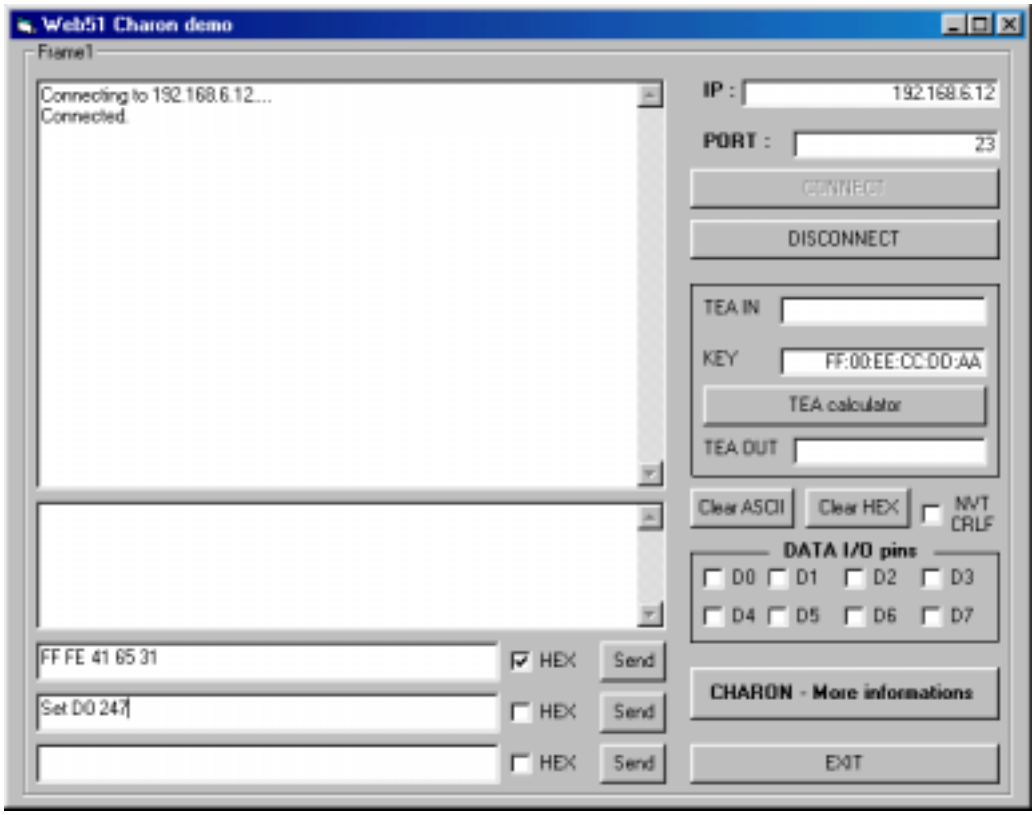
	Name	Description	Pin
	Power	External adapter power supply (8-20V)	28
	GND	Ground	29
	GND	Ground	20
	I0	Opt coupler Input 5-15V	16
	I1	Opt coupler Input 5-15V	15
	I2	Opt coupler Input 5-15V	14
	I3	Opt coupler Input 5-15V	13
	I4	Opt coupler Input 5-15V	12
	I5	Opt coupler Input 5-15V	11
	I6	Opt coupler Input 5-15V	10
	I7	Opt coupler Input 5-15V	09
	IGND	Opt couplers ground	08
	COMMON	Common free wheeling diodes	33
	O0	Output transistor up to 50V and 400 mA	05
	O1	Output transistor up to 50V and 400 mA	24
	O2	Output transistor up to 50V and 400 mA	04
	O3	Output transistor up to 50V and 400 mA	23
	O4	Output transistor up to 50V and 400 mA	03
	O5	Output transistor up to 50V and 400 mA	22
	O6	Output transistor up to 50V and 400 mA	02
	O7	Output transistor up to 50V and 400 mA	21
	R7 A	Output relay D7 contact	30
	R7 B	Output relay D7 contact	31
	R7 C	Output relay D7 contact	32
	R6 A	Output relay D6 contact	26
	R6 B	Output relay D6 contact	25
	R6 C	Output relay D6 contact	27

Application Tips

- If you don't need flow control but need to power your device attached to the serial port (max. 5-10mA), you can use the RTS pin (pin 8 on the Cannon 9 connector of the converter). To have about +8V available on this pin, activate **"&R: RS485/RS422 control"**.
- If you want to allow only a certain single remote device to communicate with the converter, enter its (remote) IP address in "In IP Setup **- W: Address"** and set its mask "**N**" to 255.255.255.255.
- Learn to use the Network Virtual Terminal in your application. It is an easy and transparent way of transferring control information, standardized in **RFC2217**.
- If you use the conversion to RS485, set the configuration to **&R2** or **&R3** and don't forget to turn HALF DUPLEX on using **&H1.**
- Take advantage of our configuration and application software, it is free. Up-to-date versions of our control subroutines are available at our website, or we can e-mail them to you if you prefer.

Free Application Software

Take advantage of the supplied free SW, either for configuring or for ideas for writing drivers. Detailed description of the free subroutines, TEA encryption, and our NVT implementation is available in the **"Programming Ethernet Applications" document.**



The depicted Web51 Charon demo terminal is a simple terminal for transferring data through the Windows network layer.

The program is available with its source code - Visual Basic 6.

According to the checkboxes **"DATA I/O pins"**, the program mixes a 6-byte control word that sets the parallel outputs into the data stream. It is possible to control, for example, a LED on the parallel output of the I/O Controller or the Charon I module.

Some of our related products

RS232 - Ethernet Converter

Industrial version of our RS232 converter for TCP/IP or UDP/IP protocols. RS485 conversion module is available. Configurable over UDP/IP or RS232.

- All serial parameters configurable (50-115.200 Bd, 7-9 data bits, parity,)
- Supports 9-bit transfer protocols
- Secure configuration over the Ethernet
- Support for an internal or external RS485 converter (protocol detection, converter addressing, HW echo, waiting for silence on half-duplex media, etc.)
- Support for proprietary protocols can be added

Embedded RS232 - Ethernet Converter Module

Embedded module, approx. 40x50 mm with 2x12 pins.
Ethernet connection on one side, RS232 and 8 TTL inputs controllable over the network on the other side. Only the RJ45 connector with a built-in magnetic (supplied) for connecting a network TP cable is outside of the module.
Continuously updated firmware available free of charge in the following versions:

- **RS232 – Ethernet Converter -** described in this document
- **SNMP** – controls up to 64 remote I/O ports
- **Empty (raw) version -** user programmable, contains the I/O Controller Lite

The module price is about half of the converter price!

Ethernet - serial Buffer 512 kB

Buffer with 512 kB of FLASH memory for data received from the serial line. Data can be read out over the Ethernet using the TCP/IP protocol. If the buffer overflows, a warning e-mail is sent to the operator.

- Secure reading of data from the buffer
- E-mail warning when buffer is filling up (two levels corresponding to about 75% and 90% of capacity) or when a power outage occurs
- 512 kB of FLASH memory with space compression support
- Powerful remote configuration options, easy installation

Recommended literature and references

- **Programming Ethernet Applications (21 pages)**
  Detailed how-to for Ethernet application programming. Documented examples of the source codes supplied with our devices. Description of the NVT and the TEA algorithms.

- **Charon I - datasheet (12 pages)**
  Datasheet for the Charon I web51 based modules. Contains in particular the electrical parameters, connector descriptions, programming procedures, etc. Circuit diagram is available for download at our website.
  Detailed informations for every application (for example the RS232-Ethernet Converter) is not part of this datasheet.

- **RS232 - Ethernet Converter**
  - Physical description of the "boxed" converter.
  - Details and the SETUP description of the "**RS232-Ethernet Converter**" application available for the "**Charon I**" modules as well.

- WWW pages of the **HW Group** about final products: **www.HWgroup.cz**

- For professionals and developers: **Web51 Project** - **http://Web51.HW-server.com**

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